



Published in final edited form as:

*J Hypertens.* 2012 December ; 30(12): 2285–2292. doi:10.1097/HJH.0b013e3283599b9a.

## Association of birthplace and self-reported hypertension by racial/ethnic groups among US adults – National Health Interview Survey, 2006–2010

Jing Fang, MD, MS, Carma Ayala, PhD, and Fleetwood Loustalot, PhD, FNP

Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention

### Abstract

**Background**—Over the past few decades, the proportion of US adults who were foreign-born has been increasing, as has the overall prevalence of hypertension. Here we compared the prevalence of self-reported hypertension among native-born adults with that among foreign-born adults, classified by racial/ethnic group.

**Methods**—Using 2006–2010 data from the National Health Interview Surveys (NHIS), we compared the age-adjusted prevalence of hypertension among native-born adults to foreign-born adults, specified by continent of birthplace and race/ethnicity. Results are expressed as unadjusted odds ratios (ORs) and three sets of adjusted odds ratios (AORs) adjusted for selected sociodemographic, behavioral and health-related characteristics. All results accounted for NHIS sampling design variables.

**Results**—The analytic sample was 124,260 with 16.3% foreign-born adults. Among the foreign born adults, 56% were from Central or South America, 22% from Asia, 13% from Europe, and 4% from Africa. Overall and after adjustment, hypertension prevalence was significantly higher among US-born adults than among foreign-born adults (AOR: 1.28, 95% CI: 1.21–1.36). By race/ethnicity, hypertension prevalence was higher among US-born non-Hispanic blacks than either foreign-born non-Hispanic blacks (AOR: 1.24, 95% CI: 1.02–1.50) or all Africa-born immigrants of any race/ethnicity (AOR: 1.45, 95% CI: 1.07–1.97). Among foreign-born adults, duration of US residence was positively associated with the likelihood of hypertension.

**Conclusion**—Hypertension prevalence was higher among US-born adults than among foreign-born adults and higher among US-born non-Hispanic blacks than in any other group. Among foreign-born adults, hypertension risk increased with the number of years they had lived in the US.

### Keywords

Hypertension; Birthplace; Race/Ethnicity

## Introduction

The estimated number (and percentage) of US residents born outside of the United States (US) has increased substantially over the past four decades, from 9.6 million (4.7%) in 1970 to 31.1 million (11.1%) in 2000<sup>1</sup> to 38.5 million (12.5%) in 2009.<sup>2</sup> During that general time period, the distribution of foreign-born residents by region of birth has also changed substantially. For example, in 1960, 75% of foreign-born residents were from Europe, whereas in 2009, more than 80% were from Central America, South America, or Asia.<sup>2</sup> Results from previous studies have shown significant associations between nativity status and rates of death attributable to cardiovascular disease,<sup>3,4</sup> including significantly higher rates among native-born non-Hispanic blacks than among blacks born in other countries (for example, 225 vs. 143 per 100,000 among men and 144 vs. 93 per 100,000 among women in 1990s).<sup>4</sup> In addition, numerous studies have found that non-Hispanic blacks are at higher risk for hypertension than non-Hispanic whites.<sup>5</sup> However, variations in the distribution of cardiovascular risk factors including hypertension and obesity among US adults by nativity status and the impact of race/ethnicity on the relationship between nativity status and the prevalence of these risk factors has been less reported. The positive association between obesity and hypertension has been demonstrated from large population based studies and the correction is strong and consistent.<sup>6</sup>

To our knowledge, the relationship between nativity status and race/ethnicity and the risk for hypertension, one of the major risk factors for cardiovascular disease,<sup>7</sup> has not been reported. In this study, we used data from National Health Interview Survey (NHIS) to examine the relationship between the nativity status of US adults and their risk for hypertension, both overall and within various racial/ethnic groups.

## Methods

### Data

We analyzed 2006–2010 data from the NHIS, a nationally representative survey of civilian, non-institutionalized US residents.<sup>8</sup> The survey has been in the field virtually continuously since 1957 and is conducted in English or Spanish by trained staff who interview survey participants in their homes. The NHIS is a multistage, complex probability sample which includes clustering, stratification, and oversampling of minority subpopulations (including non-Hispanic Black, Hispanic, and non-Hispanic-Asian). Detailed information about the NHIS can be found at <http://www.cdc.gov/nchs/nhis.htm>. Sample adult and person files of NHIS were combined for this study.

### Study Measures

All information was obtained by self report from participants.

We obtained birthplace information using the question, “Were you born in the United States?”. Participants who were not born in the US were asked, “In what country were you born?” and “About how long have you been in the United States?”. Based on the question responses, we classified participants as “US-born” or “foreign-born”, and further classified foreign-born participants by continent of birthplace: “Central or South America,” “Europe,”

“Africa,” “Asia,” or “Other area”(which included responses of “Middle East” and “Elsewhere”). The length of time living in the US was classified as <5 years, 5 to <10 years, 10 to <15 years, or ≥15 years.

We classified respondents as having hypertension if they answered “Yes” to both of the following questions: 1) “Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?”, and 2) “Were you told on two or more different visits [to a health professional] that you had hypertension, also called high blood pressure?”. We classified respondents as having diabetes if they responded “Yes” to the question, “Other than during pregnancy [optional for women], have you ever been told by a doctor or health professional that you have diabetes or sugar diabetes?”.

Demographic covariates included age (18–44 years, 45–64 years, or ≥65 years), sex, level of education (less than high school graduate, high school graduate, some college, or college graduate), and race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, non-Hispanic Asian, or non-Hispanic other). Health insurance status was defined as insured (persons who reported having health insurance at the time of the interview under any of the following: private health insurance, Medicare, Medicaid, State Children's Health Insurance Program, a State-sponsored health plan, other government programs, or military health plan) and not insured (did not have any of above). Health risk factors included, smoking status (never smoked, formerly smoked, or currently smoke); alcohol consumption status (nondrinker: <12 drinks in entire life, former drinker: no drinks in previous year, moderate drinker: 7–14 drinks per week for women/14–21 drinks per week for men, or heavy drinker: >21 drinks per week for women/>28 drinks per week for men); total leisure-time aerobic physical activity based on current guidelines<sup>9</sup> (active: ≥150 minutes/week of moderate-intensity equivalent leisure-time aerobic activity; insufficiently active: 10–149 minutes/week of moderate-intensity equivalent leisure-time aerobic activity; or inactive: <10 minutes/week of any aerobic physical activity); and weight classification by body mass index (BMI) was based on self-reported height and weight (weight in kilograms/height in meters<sup>2</sup> underweight: BMI <18.5, normal weight: BMI 18.5–24.9, overweight: BMI 25.0–29.9, or obese: BMI ≥30).<sup>10</sup>

## Data Analysis

Using the  $\chi^2$  test, we compared the overall prevalence of hypertension among US-born adults with that among foreign-born adults (both adjusted to the projected 2000 US standard population, with the age groups 18–24, 25–44, 45–64 and ≥65 years), as well as the prevalence stratified by selected demographic and descriptive characteristics. Using multiple logistical regression models, we then calculated unadjusted ORs describing the risk for hypertension among US-born adults compared with that among foreign-born adults (model 1) and AORs describing the difference in risk for hypertension between the two groups adjusted for an increasing number of demographic and descriptive characteristics (models 2–4). Model 2 adjusted for age, sex, level of education, and health insurance status. Model 3 adjusted for all variables from model 2 plus smoking status, alcohol intake, and physical activity. Model 4 adjusted for all variables from model 3 plus weight classification and diabetes status. We calculated ORs overall, as well as stratified by race/ethnicity and

birthplace. We also conducted logistic regression analysis among foreign-born adults to assess whether duration of US residence was associated with hypertension risk and obesity.

In all analyses, we used sampling weights and accounted for the complex sampling design of the NHIS and conducted all analyses using of SAS-callable SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, North Carolina).<sup>11</sup> All statistical tests were 2-tailed, and we considered  $p$  values  $<0.05$  to be indicative of significant differences in risk for hypertension. We considered any estimate whose standard error was  $>30\%$  of the estimate to be unreliable. All records with unknown were coded as missing.

## Results

Of 124,260 adults in the final analytic sample, 16.3% were foreign-born (Table 1). Compared with US-born adults, foreign-born adults had a significantly younger average age, were more likely to be male, and were less likely to have a high school education. Foreign-born adults had a lower proportion of non-Hispanic whites and non-Hispanic blacks and a much higher proportion of Hispanics and non-Hispanic Asians than US-born adults. They were also less likely to have health insurance coverage, to be current smokers, to be heavy drinkers, to be classified as physically active, and to be classified as obese (Table 1).

Of the foreign-born adults, 56% were from Central or South America, 22% from Asia, 13% from Europe, 4% from Africa, and 5.7% from other places; 58% had lived in US for 15 years or more; and only 12% had lived in US for less than 5 years. In further analyses, we eliminated those with racial/ethnic group of “non-Hispanic other” ( $n=3,335$ ) and those born in “other” places ( $n=2,798$ ).

As anticipated, race/ethnicity and place of birth of foreign-born adults were highly associated ( $p<0.001$ ): 93% of those born in Europe were non-Hispanic whites; 70% of those born in Africa were non-Hispanic blacks; 89% of those born in Central or South America were Hispanics and 94% of those born in Asia were non-Hispanic Asians (Figure 1).

The overall age-adjusted prevalence of hypertension was significantly higher among US-born adults (24.5%, 95% CI 24.1%–24.8%) than among foreign-born adults (20.4%, 95% CI 19.7%–21.0%) ( $p>0.001$ ) (Table 2). Prevalence estimates stratified by demographic and descriptive characteristics also showed the prevalence of hypertension to be significantly higher among US-born adults in all subpopulations, except those aged 65 years or older, those classified as heavy drinkers, and those classified as underweight or normal weight (Table 2). Among foreign-born adults, the prevalence of hypertension was significantly higher among those who had lived in US 15 years or more (21.8%, 95% CI 21.1%–22.6%) than among those who had lived in the US for less than 5 years (15.5%, 95% CI 12.5%–19.1%). Those born in Asia had a lower prevalence of hypertension than those born in other regions. Age-adjusted prevalence of obesity was higher among US-born (28.0%, 95% CI 27.5–28.4%) than foreign-born adults (20.5%, 95% CI 19.8–21.2%). Higher prevalence of obesity among US-born was observed for all racial/ethnic groups – non-Hispanic whites (25.8% (25.3–26.2%) vs 18.0% (16.4–19.6%)), non-Hispanic blacks (38.2% (37.2–39.1%) vs 22.7% (20.5–25.0%)), Hispanics (35.2% (33.8–36.7%) vs 27.0% (26.0–28.0%)), non-

Hispanic Asians (14.2% (12.4–16.3%) vs 7.5% (6.6–8.4%)) and non-Hispanic Others (41.1% (36.6–45.7%) vs 35.6% (23.9–49.4%)).

Both unadjusted ORs and AORs indicated that risk for hypertension was significantly higher among US-born residents than among foreign-born residents overall; however, after full adjustment, the difference in risk within racial/ethnic groups remained significant only between US-born non-Hispanic blacks with foreign-born non-Hispanic blacks (OR: 1.24, 95% CI: 1.02–1.50) and with African immigrants of any race/ethnicity (OR: 1.45, 95% CI: 1.07–1.97) (Table 3). Stratifying participants into 3 age groups, the association of birthplace and hypertension was observed only among young (18–44 years) and middle age (45–64 years) groups – specifically, the association was found among young non-Hispanic black participants and middle aged Hispanic participants. Among those, US-born had higher risk of hypertension than foreign-born. Among those 65 years and above, birthplace was not related to risk of hypertension (Table 4).

Among all foreign-born residents, fully adjusted multivariate analysis results showed that those who had lived in the US for at least 15 years were significantly more likely to have hypertension than those who had lived in the US less than 5 years (OR: 1.46, 95% CI: 1.06–2.02); however, non-Hispanic Asian immigrants were the only racial/ethnic group in which hypertension risk was significantly higher among those who had lived in US for more than 15 years than among those who had lived in the US for less than 5 years (OR: 2.10, 95% CI: 1.22–3.60) (Figure 2). The association of years living in the US and risk of obesity showed that risk of obesity increased significantly among those who lived in the US for >15 years, compared to those who lived in the US <5 years. This was observed overall, and among each racial/ethnic group (data not shown).

## Discussion

The results of this study support previous findings showing that US-born blacks have a higher risk for cardiovascular disease than foreign-born blacks.<sup>34</sup> Although we found a significantly higher overall prevalence of hypertension among US-born adults than among foreign-born adults, non-Hispanic blacks were the only racial/ethnic group in which the prevalence of hypertension differed significantly by nativity status. We also found a significantly higher overall prevalence of hypertension among immigrants who had lived in the US for more than 15 years than among those who had lived in the US for less than 5 years; however, foreign-born non-Hispanic Asians were the only group in which hypertension prevalence varied significantly by duration of US residency.

Results from previous studies have shown that risk for death attributable to cardiovascular disease is higher among US-born residents than among foreign-born residents,<sup>3, 4, 12</sup> and that hypertension prevalence increases with acculturation among US immigrants,<sup>13</sup> particularly among Hispanic immigrants.<sup>14, 15, 16</sup> Similarly, results of an international collaborative study of hypertension prevalence among non-Hispanic blacks showed the prevalence to be 16% in West Africa, 26% in the Caribbean, and 33% in the US.<sup>17</sup> In addition, results of a meta-analysis showed that acculturation to western society among

immigrants from less developed countries was associated with increased risk of hypertension.<sup>18</sup>

Obesity is an important risk factor for hypertension.<sup>619</sup> Data from the National Health and Nutrition Examination Survey showed that compared with normal weight, risk of hypertension was 70% higher among those classified as overweight and 160% higher among those classified as obese adults.<sup>20</sup> In this study, we also found higher risk of obesity among US-born than foreign-born for all racial/ethnic groups and risk increased with the years living in the US. Other major health risk factors for hypertension include physical inactivity, heavy alcohol drinking, smoking, and a diet high in sodium or low in potassium.<sup>2122</sup> Our findings showed that US-born adults were more likely to be current smokers and more likely to be heavy drinkers than foreign-born adults. However, on average, US-born adults engaged in more aerobic physical activity. Other studies have reported increased risk factors, such as high sodium, low potassium intake and high sodium/potassium ratio among US blacks compared to blacks from West Africa and blacks from Caribbean, suggesting a potential increased risk among US-born non-Hispanic blacks.<sup>17</sup> A study of acculturation among Asian immigrants found that Asian immigrants who wanted to “fit in” American society were more likely to eat a prototypically American diet instead of traditional Asian foods than were Asian immigrants less concerned about fitting in to society.<sup>23</sup> Our finding that risk of obesity among immigrants increased with the number of years they had been living in the US was consistent with these results as well as with those from other studies of the relationship between acculturation to Western society and risk for hypertension.<sup>13</sup> However, for hypertension, the fact that we found this association only among Asian immigrants indicates that further studies of the relationship between acculturation and hypertension risk are needed, especially studies involving a larger sample of foreign-born non-Hispanic blacks.

Interestingly, age was an important factor in the association of birthplace and hypertension. Stratifying by age, the significant association was only observed among young and middle-aged adults in select racial/ethnic groups. This finding suggests that further longitudinal study is needed to determine the impact of immigration on the development of hypertension.

### Study limitations

Our findings should be viewed in light of three possible limitations. First, because the hypertension status of study participants was based on self-reports, and about 20% of US adults have been found to be unaware that they have hypertension,<sup>24</sup> our prevalence estimates were probably low for all population groups, and perhaps disproportionately low for immigrants, who generally have less access to health care than US-born residents. However, study results have shown that hypertension prevalence estimates based on self-reports of hypertension status were valid in comparisons of hypertension prevalence among US population by birthplace.<sup>25</sup> Second, while the *2008 Physical Activity Guidelines for Americans* refer to any kind of aerobic physical activity, NHIS measures used included only leisure-time aerobic physical activity, which may underestimate the total aerobic physical activity. Finally, our finding that foreign-born residents had a lower prevalence of hypertension than US residents was likely attributable in part to US immigrants being



generally healthier than people from the same country who did not immigrate.<sup>26</sup> However, it is not clear whether the magnitude of this self-selection bias differed by race/ethnicity.

## Conclusion

Our results, using a national sample of US adults, showed that the prevalence of hypertension was higher among US-born adults than among foreign-born adults, that the prevalence of hypertension was higher among non-Hispanic blacks than in any other racial/ethnic group, and that the difference in prevalence by nativity status was greatest among non-Hispanic blacks. Results also showed among foreign-born adults, risk for hypertension increased with the length of time they had resided in the US, which strongly suggests that environmental factors played an important role in the associations we found between nativity status and risk for hypertension. Entities best able to promote positive health changes and thus help reduce the prevalence of hypertension among US-born non-Hispanic blacks, the population identified at highest risk in this study, may include community-based programs such as Racial and Ethnic Approaches to Community Health (REACH),<sup>27</sup> and faith-based community support networks.<sup>28</sup>

## Acknowledgments

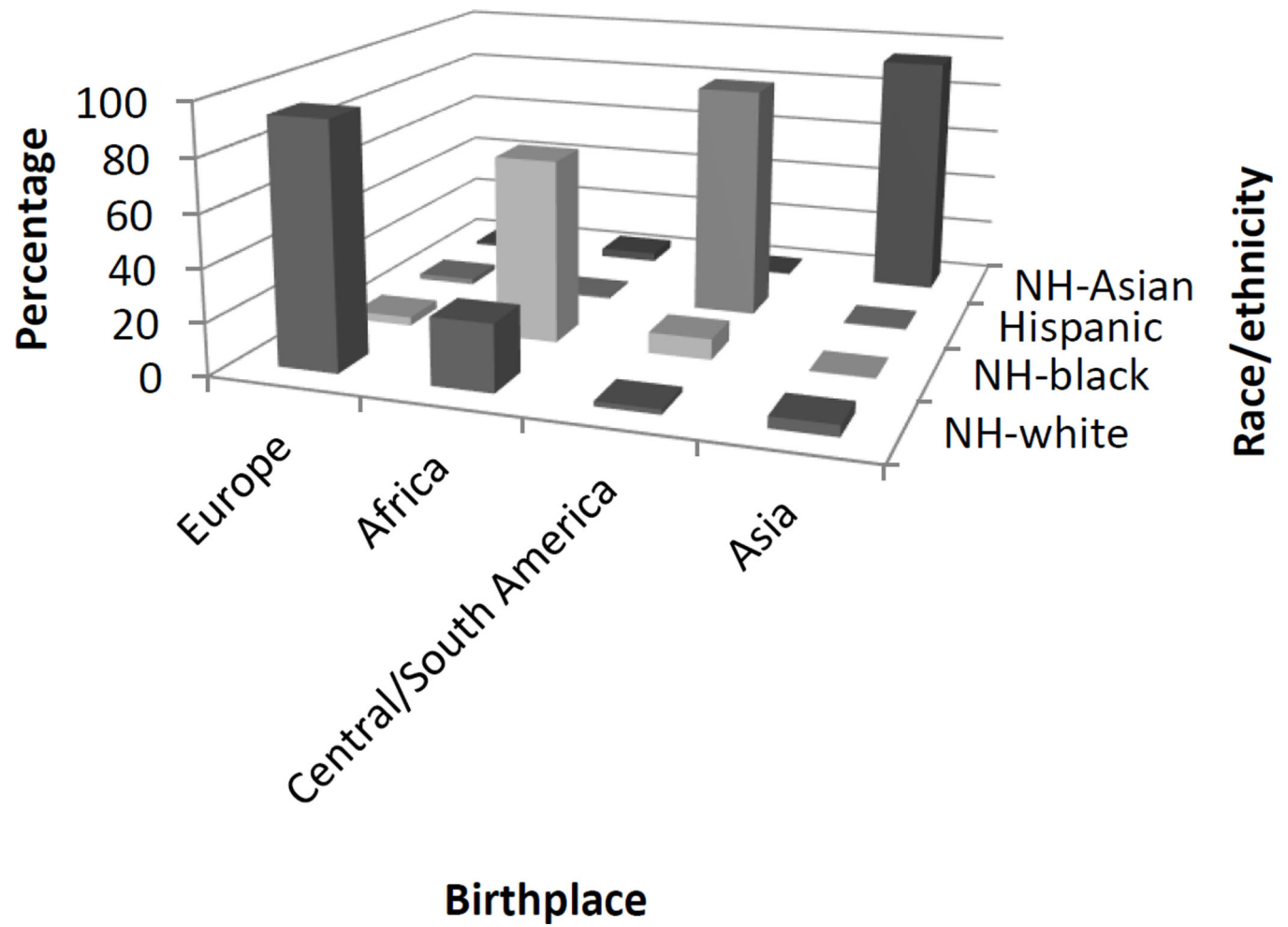
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

## References

1. Campbell, G.; Jung, K. Historical census statistics on the foreign-born population in the United States: 1850 to 2000. US Census Bureau: Population Division Working Paper, 2006, Number 81. Available at: [www.census.gov/population/www/techpap.html](http://www.census.gov/population/www/techpap.html)
2. Grieco, EM.; Trevelyan, EN. US Census Bureau; 2010. Place of birth of the foreign-born population: 2009. Available at: <http://www.census.gov/prod/2010pubs/acsbr09-15.pdf>
3. Fang J, Madhavan S, Alderman MH. The association between birthplace and mortality from cardiovascular causes among black and white residents of New York City. *New Engl J Med*. 1996; 335:1545–1551. [PubMed: 8900086]
4. Fang J, Madhavan S, Alderman MH. Nativity, race, and mortality: the favorable impact of birth outside the United States on mortality in New York City. *Hum Biol*. 1997; 69:689–701. [PubMed: 9299888]
5. Roger VL, Go AS, Lloyd-Jones DM, et al. on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2012 update: a report from the American Heart Association. *Circulation*. 2012; 125:e12–e230.
6. Dorresteyn JAN, Visseren FLJ, Spiering W. Etiology and pathophysiology mechanisms linking obesity to hypertension. *Obesity Reviews*. 2012; 13:17–26. [PubMed: 21831233]
7. Mancia G, De Backer G, Dominiczak A, et al. 2007 ESH-ESC Practice Guidelines for the Management of Arterial Hypertension: ESH-ESC Task Force on the Management of Arterial Hypertension. *J. Hypertens*. 2007; 25:1751–1762. [PubMed: 17762635]
8. Botman SL, Moore TF, Moriarty CL, Parsons VL. Design and estimation for the National Health Interview Survey, 1995–2004. National Center for Health Statistics. *Vital Health Stat*. 2000; 2(130)
9. United States Department of Health and Human Services. Physical Activity Guidelines Advisory Committee Report, 2008. Hyattsville, MD: United States Department of Health and Human Services; 2008.
10. National Heart, Lung, and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health; [Indicate year of publication]

11. Frane, J. SUDAAN: professional software for survival data analysis. Research Triangle Park, NC: Research Triangle Institute; 1989.
12. Singh GK, Siahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: an analysis of two national data bases. *Hum Biol.* 2002; 74:83–109. [PubMed: 11931581]
13. Moran A, Roux AV, Jackson SA, et al. Acculturation is associated with hypertension in a multiethnic sample. *Am J Hypertens.* 2007; 20(4):354–363. [PubMed: 17386340]
14. Goslar PW, Macera CA, Castellanos LG, Hussey JR, Sy FS, Sharpe PA. Blood pressure in Hispanic women: the role of diet, acculturation, and physical activity. *Ethn Dis.* 1997; 7:106–113. [PubMed: 9386950]
15. Espino DV, Maldonado D. Hypertension and acculturation in elderly Mexican Americans: results from 1982–84 Hispanic HANES. *J Gerontol.* 1990; 45:M209–M214. [PubMed: 2229944]
16. Borrell LN, Menendez BS, Joseph SP. Racial/ethnic disparities on self-reported hypertension in New York City: examining disparities among Hispanic subgroups. *Ethn Dis.* 2011; 21:429–436. [PubMed: 22428346]
17. Cooper R, Rotimi C. Hypertension in populations of West African origin: is there a genetic predisposition? *J Hypertens.* 1994; 12(3):215–227. [PubMed: 8021474]
18. Steffen PR, Smith TB, Larson M, et al. Acculturation to western society as a risk factor for high blood pressure: a meta-analytic review. *Psychosom Med.* 2006; 68:386–397. [PubMed: 16738069]
19. Davy1, Kevin P.; Hall2, John E. Obesity and hypertension: two epidemics or one? *Am J Physiol Regul Integr Comp Physiol.* 2004; 286:R803–R813. [PubMed: 15068965]
20. Nguyen NT, Magno CP, Lane KT, Hinojosa MW, Lane JS. Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: findings from the National Health and Nutrition Examination Survey, 1999 to 2004. *J Am Coll Surg.* 2008; 207:928–934. [PubMed: 19183541]
21. Vasan RS. A risk score for risk factors: rationale and roadmap for preventing hypertension. *Hypertension.* 2009; 54:454–456. [PubMed: 19597035]
22. Miller ER 3rd, Erlinger TP, Young DR, et al. Results of the Diet, Exercise, and Weight Loss Intervention Trial (DEW-IT). *Hypertension.* 2002; 40:612–618. [PubMed: 12411452]
23. Guendelman MD, Cheryan S, Monin B. Fitting in but getting fat: identity threat and dietary choices among US immigrant groups. *Psychol Sci.* 2011; 22(7):959–967. [PubMed: 21653909]
24. Yoon, S.; Ostchega, Y.; Louis, T. NCHS data brief, no 48. Hyattsville, MD: National Center for Health Statistics; 2010. Recent trends in the prevalence of high blood pressure and its treatment and control, 1999–2008.
25. White K, Avendano A, Capistrant BD, et al. Self-reported and measured hypertension among older US- and foreign-born adults. *J Immigrant Minority Health.* [Provide appropriate reference citation.]
26. Choi SH. Testing healthy immigrant effects among late life immigrants in the United States: using multiple indicators. *J Aging Health.* 2011 Dec 9.
27. Liao Y, Tucker P, Okoro CA, et al. REACH 2010 surveillance for health status in minority communities—United States, 2001–2002. *MMWR Surveill Summ.* 2004; 53:1–36. [PubMed: 15329648]
28. Dodani S, Sullivan D, Pankey S, et al. HEALS: a faith-based hypertension control and prevention program for African American churches: training of church leaders as program interventionists. *Int J Hypertens.* 2011; 2011:820101. [PubMed: 21747983]





**Figure 1.**  
Racial/ethnic distribution among US immigrants, by region of birth—National Health Interview Survey, 2006–2010



**Table 1**

Distributions of selected characteristics among US adults and a comparison of distributions by nativity status, National Health Interview Survey, 2006–2010

Characteristic	Overall N=124,260 % (SE)	US-born N=99,520 % (SE)	Foreign-born N=24,740 % (SE)	p-value
%	100%	83.7 (0.25)	16.3 (0.25)	
Age (yrs)				<0.001
18–44	49.1 (0.31)	47.5 (0.33)	57.6 (0.51)	
45–64	34.4 (0.23)	35.1 (0.25)	30.7 (0.42)	
65	16.5 (0.22)	17.4 (0.24)	11.6 (0.30)	
Sex				
Female	51.7 (0.18)	52.1 (0.20)	49.8 (0.42)	<0.001
Male	48.3 (0.18)	47.9 (0.20)	50.2 (0.42)	
Race/ethnicity				<0.001
Non-Hispanic white	69.2 (0.37)	78.8 (0.34)	19.9 (0.46)	
Non-Hispanic black	11.8 (0.26)	12.6 (0.30)	7.7 (0.34)	
Hispanic	13.5 (0.26)	6.4 (0.14)	50.2 (0.77)	
Non-Hispanic Asian	4.6 (0.10)	1.3 (0.04)	21.6 (0.53)	
Non-Hispanic other	0.9 (0.08)	0.9 (0.10)	0.6 (0.08)	
Education				<0.001
<high school graduate	18.3 (0.23)	15.4 (0.22)	32.9 (0.57)	
High school graduate	25.2 (0.22)	26.2 (0.25)	20.1 (0.33)	
Some college	29.7 (0.22)	31.6 (0.24)	19.7 (0.36)	
College graduate	26.8 (0.31)	26.7 (0.33)	27.3 (0.55)	
Years living United States				
<5			11.8 (0.35)	
5 to <10			15.7 (0.30)	
10 to <15			14.3 (0.28)	
15			58.2 (0.56)	
Birthplace (foreign-born adults only)				
Europe			12.8 (0.36)	
Africa			3.8 (0.18)	
Central/ South America			55.7 (0.78)	
Asia			22.0 (0.56)	
Other			5.7 (0.25)	
Health insurance (yes)	82.8 (0.19)	85.8 (0.18)	67.1 (0.58)	<0.001
Smoking status				<0.001

Characteristic	Overall N=124,260 % (SE)	US-born N=99,520 % (SE)	Foreign-born N=24,740 % (SE)	p-value
Never smoked	58.2 (0.25)	55.3 (0.27)	73.0 (0.38)	
Current smoker	20.2 (0.20)	21.9 (0.22)	11.8 (0.27)	
Former smoker	21.6 (0.19)	22.8 (0.21)	15.2 (0.28)	
Alcohol intake category <sup>1</sup>				<0.001
Nondrinker	22.1 (0.28)	19.0 (0.30)	38.0 (0.43)	
Former drinker	14.7 (0.18)	15.4 (0.20)	11.0 (0.27)	
Light to moderate drinker	57.9 (0.26)	59.8 (0.30)	48.7 (0.40)	
Heavy drinker	5.3 (0.10)	5.9 (0.11)	2.4 (0.11)	
Aerobic Physical Activity <sup>2</sup>				<0.001
Inactive	36.1 (0.39)	34.3 (0.42)	45.0 (0.47)	
Insufficiently Active	19.8 (0.18)	20.1 (0.20)	18.5 (0.36)	
Active	44.1 (0.34)	45.6 (0.37)	36.5(0.45)	
Body Mass Index <sup>3</sup>				<0.001
Underweight	1.76 (0.05)	1.7 (0.06)	2.1 (0.12)	
Normal weight	36.2 (0.21)	35.5 (0.22)	39.7 (0.49)	
Overweight	35.0 (0.17)	34.5 (0.19)	37.9 (0.42)	
Obese	27.0 (0.20)	28.3 (0.22)	20.4 (0.35)	
Diabetes (yes)	8.5 (0.11)	8.6 (0.12)	8.2 (0.24)	0.167

p-value are test the association of birthplace (US-born vs foreign-born) and characteristics

SE = standard error; BMI = body mass index

<sup>1</sup> Nondrinkers were defined as those who reported having consumed <12 drinks in their lives, former drinkers as those who reported having consumed 12 drinks but none in the previous year, light to moderate drinkers as women who reported consuming 7 drinks/week or men who reported consuming 14 drinks/week, and heavy drinkers as women who reported consuming >7 drinks/week or men who reported consuming >14 drinks/week.

<sup>2</sup> Aerobic physical activity was based on minutes per week of reported moderate- and vigorous-intensity leisure time aerobic physical activity; Inactive (less than 10 minutes per week); Insufficiently active (10–149 minutes per week); Active (150 minutes per week).

<sup>3</sup> Body Mass Index (kilogram/meters<sup>2</sup>) categories were defined as underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9) and obese (≥30).

**Table 2**

Prevalence of hypertension\* by nativity status and other characteristics, National Health Interview Survey, 2006–2010

Characteristics	Overall N=124260 % (SE)	US born N=99520 % (SE)	Foreign-born N=24740 % (SE)	p-value
Total	23.8 (0.15)	24.5 (0.17)	20.4 (0.32)	<0.001
Age				
18–44	8.5 (0.15)	9.3 (0.18)	5.5 (0.24)	<0.001
45–64	32.8 (0.32)	33.8 (0.34)	27.4 (0.75)	<0.001
≥65	55.3 (0.39)	55.4 (0.42)	54.5 (1.09)	NS
Sex				
Women	23.6 (0.21)	24.2 (0.23)	20.9 (0.41)	<0.001
Men	23.9 (0.21)	24.7 (0.24)	19.6 (0.49)	<0.001
Race/Ethnicity				
Non-Hispanic White	23.2 (0.19)	23.3 (0.19)	20.7 (0.80)	<0.05
Non-Hispanic Black	32.4 (0.38)	33.1 (0.40)	25.9 (1.37)	<0.001
Hispanic	21.2 (0.34)	22.9 (0.57)	20.2 (0.41)	<0.05
Non-Hispanic Asian	19.7 (0.51)	23.3 (1.09)	18.7 (0.59)	<0.001
Education				
<high school	27.0 (0.36)	29.5 (0.46)	21.4 (0.52)	<0.001
High school	24.9 (0.27)	25.6 (0.30)	20.7 (0.67)	<0.001
Some college	24.3 (0.28)	24.7 (0.30)	20.8 (0.76)	<0.001
≥college	20.0 (0.24)	20.3 (0.27)	18.5 (0.62)	<0.05
Years living US				
<5 years			15.5 (1.67)	
5–<10 years			20.8 (1.26)	
10–<15 years			19.8 (1.18)	
≥15 years			21.8 (0.39)	
Birthplace				
Europe			21.2 (0.93)	
Africa			21.5 (1.96)	
Central/South America			21.1 (0.44)	
Asia			18.7 (0.63)	
Health insurance				
Yes	24.3 (0.17)	24.8 (0.18)	21.4 (0.38)	<0.001
No	19.4 (0.81)	21.5 (1.38)	15.8 (0.97)	<0.01
Smoke				

Characteristics	Overall N=124260 % (SE)	US born N=99520 % (SE)	Foreign-born N=24740 % (SE)	p-value
Never	22.4 (0.18)	23.1 (0.21)	19.8 (0.40)	<0.001
Current	23.5 (0.34)	24.1 (0.36)	17.8 (1.02)	<0.001
Former	27.3 (0.37)	27.8 (0.41)	24.3 (0.91)	<0.05
Alcohol <sup>1</sup>				
Nondrinker	23.7 (0.30)	25.0 (0.37)	20.7 (0.54)	<0.001
Former drinker	29.5 (0.41)	30.5 (0.47)	24.0 (0.83)	<0.001
Light to moderate drinker	22.2 (0.19)	22.8 (0.21)	19.0 (0.50)	<0.001
Heavy drinker	24.2 (0.68)	24.3 (0.68)	23.3 (2.39)	NS
Aerobic Physical Activity <sup>2</sup>				
Inactive	26.5 (0.23)	28.0 (0.28)	21.0 (0.45)	<0.001
Insufficiently Active	25.1 (0.30)	25.8 (0.34)	21.8 (0.66)	<0.05
Active	20.7 (0.21)	21.0 (0.24)	18.5 (0.53)	<0.05
Body Mass Index <sup>3</sup>				
Underweight	14.1 (0.81)	14.8 (0.92)	11.0 (1.40)	NS
Normal	15.5 (0.19)	15.7 (0.22)	14.6 (0.43)	NS
Overweight	22.6 (0.22)	23.0 (0.25)	21.0 (0.49)	<0.05
Obesity	36.2 (0.32)	37.1 (0.35)	30.5 (0.79)	<0.001
Diabetes				
Yes	52.0 (0.86)	53.5 (0.95)	44.5 (1.77)	<0.001
No	21.1 (0.15)	21.8 (0.17)	17.8 (0.35)	<0.001

p-values are test the difference of hypertension prevalence between US-born and foreign-born

NS – no significant difference

\* Hypertension prevalence was adjusted by age except for those with age groups and age-standardized to the 2000 US standard population.

<sup>1</sup> Nondrinkers were defined as those who reported having consumed <12 drinks in their lives, former drinkers as those who reported having consumed 12 drinks but none in the previous year, light to moderate drinkers as women who reported consuming 7 drinks/week or men who reported consuming 14 drinks/week, and heavy drinkers as women who reported consuming >7 drinks/week or men who reported consuming >14 drinks/week.

<sup>2</sup> Aerobic physical activity was based on minutes per week of reported moderate- and vigorous-intensity leisure time aerobic physical activity; Inactive (less than 10 minutes per week); Insufficiently active (10–149 minutes per week); Active (≥150 minutes per week).

<sup>3</sup> Body Mass Index (kilogram/meters<sup>2</sup>) categories were defined as underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9) and obese (≥30).



**Table 3**

Results from four logistic regression models comparing hypertension risk among US-born adults with that among foreign-born adults, overall, by race/ethnicity, and by race/ethnicity among US-born adults and region of birth among foreign-born adults—National Health Interview Survey, 2006–2010

	Model 1	Model 2	Model 3	Model 4
	Unadjusted OR (95% CI)	Adjusted for age, sex, education, health insurance OR (95% CI)	Adjusted for all factors from model 2, plus smoking, drinking, and leisure-time physical activity OR (95% CI)	Adjusted for all factors from all from model 3, plus body mass index and diabetes OR (95% CI)
<b>Groups compared</b>				
All US-born adults vs all foreign-born adults	1.60 (1.53–1.69)	1.37 (1.29–1.44)	1.37 (1.29–1.45)	1.28 (1.21–1.36)
US-born non-Hispanic whites vs foreign-born non-Hispanic whites	1.16 (1.05–1.29)	1.12 (1.00–1.25)	1.13 (1.01–1.27)	1.04 (0.92–1.17)
US-born non-Hispanic blacks vs foreign-born non-Hispanic blacks	1.63 (1.38–1.93)	1.51 (1.26–1.81)	1.41 (1.17–1.69)	1.24 (1.02–1.50)
US-born Hispanics vs foreign-born Hispanics	1.06 (0.97–1.17)	1.22 (1.09–1.37)	1.21 (1.07–1.37)	1.10 (0.96–1.25)
US-born non-Hispanic Asians vs foreign-born non-Hispanic Asians	1.25 (1.04–1.50)	1.34 (1.11–1.63)	1.31 (1.07–1.61)	1.17 (0.93–1.48)
US-born non-Hispanic whites vs foreign-born from Europe	1.08 (0.96–1.21)	1.09 (0.96–1.23)	1.10 (0.97–1.25)	1.00 (0.87–1.15)
US-born non-Hispanic blacks vs foreign-born from Africa	2.42 (1.87–3.14)	1.79 (1.36–2.35)	1.71 (1.30–2.24)	1.45 (1.07–1.97)
US-born non-Hispanic Asians vs foreign-born from Asia	1.26 (1.05–1.51)	1.35 (1.12–1.63)	1.34 (1.10–1.64)	1.21 (0.97–1.51)
US-born Hispanics vs foreign-born from Central/South America	0.98 (0.89–1.08)	1.12 (1.00–1.26)	1.11 (0.99–1.24)	0.99 (0.87–1.13)

OR = odds ratio; CI = confidence interval

**Table 4**

Odds ratios\* of hypertension among US-born as compared to foreign-born by age groups and by race/ethnicity, National Health Interview Survey, 2006–2010

	18–44 years	45–64 years	≥65 years
All	1.27 (1.11–1.45)	1.15 (1.04–1.28)	0.95 (0.84–1.08)
Non-Hispanic white	1.30 (0.94–1.82)	1.04 (0.87–1.25)	0.90 (0.77–1.06)
Non-Hispanic black	1.50 (1.10–2.03)	1.12 (0.88–1.44)	1.23 (0.76–2.00)
Hispanic	1.02 (0.81–1.28)	1.33 (1.11–1.58)	0.87 (0.70–1.08)
Non-Hispanic Asia	0.99 (0.64–1.52)	1.20 (0.85–1.68)	1.12 (0.74–1.69)

Adjusted for sex, education level, health insurance status, smoking, alcohol intake, physical activity, diabetes and body mass index.